On being examined: do students and faculty agree?

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Submitted 27 May 2015; accepted in final form 14 September 2015

Perrella A, Koenig J, Kwon H, Nastos S, Rangachari PK. On being examined: do students and faculty agree? Adv Physiol Educ 39: 320–326, 2015; doi:10.1152/advan.00078.2015.—Students measure out their lives, not with coffee spoons, but with grades on examinations. But what exams mean and whether or not they are a bane or a boon is moot. Senior undergraduates (A. Perrella, J. Koenig, and H. Kwon) designed and administered a 15-item survey that explored the contrasting perceptions of both students (n = 526) and faculty members (n = 33) in a 4-yr undergraduate health sciences program. A series of statements gauged the level of agreement on a 10-point scale. Students and faculty members agreed on the value of assessing student learning with a variety of methods, finding new information to solve problems, assessing conceptual understanding and logical reasoning, having assessments with no single correct answer, and having comments on exams. Clear differences emerged between students and faculty members on specific matters: rubrics, student choice of exam format, assessing creativity, and transfer of learning to novel situations. A followup questionnaire allowed participants to clarify their interpretation of select statements, with responses from 71 students and 17 faculty members. All parties strongly agreed that exams should provide a good learning experience that would help them prepare for the future (students: 8.64 ± 1.71 and faculty members: 8.03 ± 2.34).

active learning; assessment; evaluation; scholarship of teaching; undergraduate education

ERNEST STARLING, in his preface to Alcock and Ellion’s textbook of physiology, bemoaned the impact of examinations on student learning. He pointedly termed the office of examinations as “the bane of higher education” in Great Britain at that time, with the term “bane” referring to the noxious or toxic effect of the activity (2). That examination has a powerful effect on learning was recognized much earlier with Melanchthon (cited in Ref. 21) emphasizing more positive effects: “It whets the desire for learning, it enhances the solicitude of study while it animates the attention to whatever is taught.” Whether examinations are a bane or a boon may always remain a moot point.

In general, all educational endeavors seek to bring about changes in a student’s knowledge, skills, or attitudes. All assessment procedures (tests, examinations, projects, and quizzes) seek to determine whether such changes have occurred. More effort is directed toward the first two, since, in general, these are more amenable to measurement (32).

Perspectives of students and faculty members on examinations could be widely different. It is difficult to separate assessment from learning since what students learn is often influenced by how they will be examined. The approaches taken by students are strongly affected by assessment procedures. Student approaches to learning have been categorized as superficial, deep, or strategic (9). Simply put, superficial learners look on tasks as external impositions and merely attempt to complete the task. Thus, they memorize without integration and fail to distinguish principles from examples. Deep learners seek to engage with the material as they aim for mastery and understanding. Strategic learners strive to obtain the highest possible grades and “play the examination game” (9). We speculate that teaching, too, can mirror or reflect these approaches. Thus, faculty members who adopt a “superficial” approach could look on teaching as an imposition a mere chore and a distraction from doing research. Thus, they seek to just complete their task and do not seek to engage their students. “Strategic” faculty members teach to the test and ensure that their students get sufficiently high grades. They may adopt this strategy either to minimize complaints or perhaps get better teaching evaluation scores. “Deep” teachers will seek to promote understanding of the material by their students. We emphasize that these categories, as applied to faculty members, are entirely speculative.

The present study sought to explore the contrasting perspectives of students and faculty members on examinations in general. We chose to focus on a single 4-yr undergraduate program at McMaster University (Hamilton, ON, Canada): the Bachelor of Health Sciences (BHSc) (Honors) program. The program sets a high premium on student-centered and active learning approaches in addition to didactic classes. Students are selected based on their high school scores, generally in the 90% range, as well as on a supplementary application. Inquiry and problem-based learning are used extensively and integrated into all 4 yr of the curriculum. Faculty members in the program are drawn from a variety of disciplines ranging from basic biomedical sciences to clinical sciences, social sciences, public health, and the humanities.

As they progress through the years, the students are introduced to a wide variety of assessment formats to accurately and appropriately assess their learning.

In years 1 and 2, students mostly take required courses, which foster self-directed and group learning. The assessments used include problem-solving exercises (triptite problem-solving exercises), oral debates, individual and group projects, and critiques of established literature (28, 31, 32). In years 3 and 4, students have fewer required courses and do a prethesis and thesis. In addition, they can take elective courses in other faculties and departments, where the assessments used vary more widely and may include standard multiple-choice question exams, bellringers, short-answer questions, quizzes, etc.

Given the nature of our program, we hypothesized that our highly motivated students would see examinations from either a strategic or deep perspective rather than a superficial perspec-
tive, whereas faculty members will align themselves with deeper approaches to assessment.

A preliminary version of this work was presented at Experimental Biology 2014 (20).

METHODS

This research consisted of two components: a survey (quantitative data collection) and a followup questionnaire (qualitative data collection).

Part 1: the Survey

The survey was designed after discussions with a small group of BHSc (Honors) students (n = 8), drawn from different years of the program, who were asked to provide terms that described what they believed to be a beneficial and detrimental assessment to their learning. These students had all helped S. Nastos and P. K. Rangachari revamp a year 1 cellular and molecular biology course and were selected because of their particular interest in educational issues.

Comments made by the students provided the basis for a survey designed to gather student and faculty perspectives regarding examination formats and utility across all 4 yr of the program. A total of 526 students (year 1: n = 132, year 2: n = 132, year 3: n = 150, and year 4: n = 112) and 33 faculty members responded to the survey. Participation in the survey was completely voluntary, and no identifiers were collected (aside from year in the program or faculty). The survey probed student and faculty opinions quantitatively by having them select their level of agreement on a series of 15 statements on a 10-point scale (where 1 = strongly disagree, 5 = ambivalent/undecided, and 10 = strongly agree). Students were instructed to give their opinions to 15 statements based on their previous educational experiences. Faculty members were instructed to give their opinions from their perspective as teachers based on their previous experience teaching and testing undergraduate students and faculty. Participation in the survey was completely voluntary, and no identifiers were collected (aside from year in the program or faculty).

Data are represented numerically as means ± SD. No outliers were removed from the data, thus ensuring the full scope of student and faculty opinions. One-way ANOVA was performed on each data set (15 data sets, 1 data set/statement) to compare among year-specific student responses and faculty responses. In addition, pairwise comparisons were made to compare among and between student (years 1–4) and faculty responses using Tukey’s test to correct for multiple comparison errors. Statistically significant differences were calculated with a minimum α set at 0.01, reducing the probability of a type I error.

Part 2: Followup Questionnaire

A short-response survey was followed to allow students and faculty members to clarify their interpretation of the statements, to tease out any ambiguity among the responses. Participation was also voluntary. For the followup questionnaire, 71 students (year 1: n = 27, year 2: n = 16, year 3: n = 17, and year 4: n = 11) and 17 faculty members responded.

Three of us (A. Perrella, J. Koenig, and H. Kwon) reviewed the responses presented in each statement (first independently and then together to reach a consensus) to identify the relative occurrence of common and disparate elements and clustered them in our discussions below.

Dr. D. G. Harnish, assistant dean of the program, gave permission for this study.

RESULTS AND DISCUSSION

The response distribution to the survey is shown in Table 1. There was a general agreement between students and faculty members on a number of issues. There was a general agreement between all students from different years and faculty members on over half of the 15 statements (statements 1, 2, 5, 6, 7, 8, 11, and 15). Not surprisingly, both groups regarded examinations as important for student learning and for providing a good learning experience to prepare for the future. This is consistent with the well-worn dictum that assessment drives learning. Students wanted multiple assessment formats, and faculty members concurred. Students felt that examinations should test their conceptual understanding and allow them to clearly and logically demonstrate their reasoning and also their abilities to find new information to solve problems. The faculty members concurred. Both students and faculty members agreed that clear comments on exams were more important than marks. However, faculty members appeared reluctant to support exams where comments alone were given without marks. This point is discussed later. The agreement of both parties to the statement concerning exams with single correct answers is interesting. Although the scores were in the midrange (clustering around 5.5 on a 10-point scale), this suggests that neither party was enthusiastic about the most common evaluation format used in the university setting (namely, multiple-choice question exams).

On a number of issues, there were clear differences of opinion between faculty members and students (statements 3, 4, 9, 10, 12, and 13) and amongst students in different years as well (statement 14). Five statements (statements 3, 4, 9, 12, and 14) in particular were selected for their relevance to the literature and current pedagogy and were thus explored in much further depth. These are considered individually below.

Statement 3: Exams With a Clear Marking Scheme (Rubric)

Howell (13) noted that few studies have gathered the perspective of faculty members on the use of grading rubrics and assigning grades. It has been found that although the use of rubrics has been shown to strengthen critical thinking skills, boost academic performance, and provide transparency to students, they are not a “silver bullet” for ensuring radical learning advances amongst all undergraduate students (13). In its most basic form, the grading rubric is a matrix that outlines levels of achievement for set criteria (3). Often, the criteria are outlined by faculty members (although as will be discussed, student-centered learning educational models have sought to return this responsibility to the student; see statement 4).

Discrepancies. There were clear differences of opinion between faculty members and students in each year.

Followup statement. To explore the discrepancy between student and faculty opinions, we posed the following followup question: What is the value of a rubric? Please explain any other concerns you had with this question.

Interpretation of statement 3 and discussion. According to our data, students were uncomfortable with ambiguity in their assessments and used the rubric as an aid to future learning, as reported by 46 of 71 respondents in our followup questionnaire. Student awareness of the criteria of their assessment is known as “transparency” (36); losing marks due to “trick questions” or for not knowing that certain information was
Faculty members, on the other hand, appeared reluctant to allow for a sense of transparency in what is expected of the students (29). Faculty members also frequently recommended the inclusion of rubrics in their assignments (30). They felt that rubrics would allow students to understand their criteria for marking and would help them justify the grades they received (30). However, they noted that rubrics could be difficult to create, as they require a high level of detail and specificity (30).

Statement 4: Students Selecting the Exam Format to Best Demonstrate Learning

One method of engaging students in their learning is to have them involved in setting their own assessment criteria (30). However, this can be challenging for faculty members, as they need to be careful not to impose limitations on students (30). Rubrics can be a useful tool in this process, as they provide a clear framework for students to work within (30). Faculty members also noted that rubrics can help students understand how their work will be evaluated (30).

Values are weighted means ± SD. Responses were scored on a scale of 1–10, where 1 = strongly disagree, 5 = ambivalent, and 10 = strongly agree. Response rates were as follows: year 1, 65%; year 2, 71%; year 3, 74%; year 4, 69%; and faculty members, 40%. NS, not significant. α = 0.01. †P ≤ 0.01, ‡P ≤ 0.001, and §P ≤ 0.0001 among students and faculty members.
even selecting assessment options that best suit their learning styles (31). Active student involvement in creating or deciding on their own methods of assessment results in greater learning outcomes (1, 7, 12, 22, 33). For this reason, we expected that this statement would elicit interesting responses.

**Discrepancies.** Our results showed a statistically significant difference of opinion between faculty members and students. Opinions between year 1 and 4 students differed as well ($P = 0.03$, between-year ANOVA), but this difference was less salient than the diverging opinions between students and faculty members.

**Followup statement.** In response to these discrepancies, we asked the following followup question: Do you believe that choosing an examination is feasible in a course setting? Please explain any other concerns you had with this question.

**Interpretation of statement 4 and discussion.** In general, students reported a desire to be involved in selecting the exam format for a course. However, 28 of 71 students across all years suggested that this is only feasible in small classes and if a majority consensus between students is obtained. Specifically, 6 of 11 year 4 students noted the logistical barriers in achieving a full class consensus. The followup questionnaire also elicited other concerns, including the fact that students may purposefully select easier exam formats to optimize grades.

Most faculty members who responded to the followup questionnaire believed that it was feasible for students to choose their own examination format (10 of 17 faculty members), whereas only 3 of 17 faculty members directly stated that this was not possible. Faculty members in the BHSc (Honors) program teach courses with varying student enrollment, and both students and faculty members agreed that it was most feasible for students to have a choice of assessment format with small classes.

It has been found that the autocratic evaluation process using faculty-written and selected exams results in lower student trust of evaluation methods (22), and when students are not involved in the process of examination organization or selection, there exists an inclination to blame the faculty for poor exam performance (22, 23).

This, to some extent, could be mitigated if student preferences could be incorporated into assessments whenever possible.

**Statement 9: Exams Allowing Creativity**

Deep learners, as discussed above, engage with the material to enhance their learning. One particularly powerful approach is to relate new ideas to existing knowledge or provide novel solutions to existing problems based on prior information (9). Although creativity is extremely hard to define (6), one element is just that: the ability to provide novel solutions. We included this statement to elicit opinions. We felt that this was different from another question where we asked students about using existing knowledge to novel situations, since the issue there was that the situation was novel rather than the solution. Thus, assessments that foster demonstration of creativity should find favor with either the deep learner or teacher. One could argue that postsecondary institutions should foster creativity and that faculty members in particular would agree with that statement. In fact, the scores for faculty members were higher than those given by students. Although the students in general were in agreement, the scores given by the students in year 3 were lower.

**Discrepancies.** We felt it necessary to explore the reasons for that discrepancy with a followup statement. As the opinion of year 3 students differed from both year 4 students ($P < 0.01$) and faculty members ($P < 0.001$), we posed the following followup question in the hopes of eliciting opinions from students in different years that could address this discrepancy: What does creativity on an examination mean to you? Please explain any other concerns you had with this question.

The responses appeared to fall into two categories. In one set, students offered explanations as to how they interpreted the term “creativity” (“free rein to interpret the examination in a way they saw fit,” “demonstrate understanding of course content in what you feel is comfortable,” “students are so comfortable with the information, they can apply it a completely different context and still have the facts accurate”). In short, all these seemed to suggest that students be given more license to answer questions in multiple ways that best suited them. The other set of answers focused on the assessment problem, the subjectivity introduced, and the risks inherent in attempting to be creative when marks were at stake. These answers highlighted the tensions between deep and strategic learning.

The answers provided by 12 of 27 year 1 students and 8 of 11 year 4 students were in the explanatory category, in contrast to only 4 of 17 year 3 students. Students in the latter cohort raised issues concerning the assessment problems. Comments made included “it would mean subjectivity and unfairness. The purpose of the exams is make sure students know the knowledge taught. Not to be creative,” “I don’t think it is fair,” and “creativity often operates within a restricted set of expectations defined by the person marking your paper.”

Both sets of responses are reasonable. Giving students an opportunity to demonstrate creativity is likely to foster deeper learning and engagement but is difficult for both faculty members and students.

**Year 3 poses some challenges for students.** Many of those who enter the program are highly motivated and have their eyes set on being admitted to professional schools, particularly medicine. It is in year 3 that they are preparing their applications to those schools and maximizing their opportunities to get high scores. Thus, any ambiguities in assessments loom as a larger threat and create more anxiety. Furthermore, a significant portion (usually a quarter of the cohort) are successful in receiving admission to professional programs and have left the program after year 3. We suspect that these could be a significant portion of the strategic learners. By the time students are in year 4, they are engaged in their thesis work and sense the value of creative explorations.

**Statement 12: Exams Testing Application to Novel Situations**

One can argue that the goal of learning is to transfer what one has learned to a novel situation. Thus, any assessment that seeks to gauge this skill should be fostered. We hypothesized that faculty members would agree with this sentiment as well as students in the later part of the program. The faculty members agreed with this. Students in year 4 were closely allied to the faculty members, although students in earlier years gave lower scores. Students may still appreciate the value and...
applicability of this type of exercise but may not fully understand the implications (9).

**Followup statement.** To allow students and faculty members to explain how they envisioned a novel examination, we posed the followup question: What does the word “novel” mean to you on an examination? Please explain any other concerns you had with this question. We were particularly interested in probing whether similar responses by year 4 students and faculty members would support the quantitative data shown in Table 1.

**Interpretation of statement 12 and discussion.** According to our followup survey, 36 of 71 students across all years defined novelty in an examination as a situation or concept they have not seen before in class. Several students specifically referred to exercises they had taken in earlier course (triptartite problem-solving exercise) as examples (28). However, student opinions also noted that there exists a level of uncertainty with respect to what will be asked of them on these types of exams, which is often seen as a barrier to achieving high marks. Novel situations (17) demand higher-order cognitive skills, which often cause problems to a majority of students.

Open-ended assessments require students to use deeper learning (35). This was noted in year 4 students, 5 of 11 of whom reported that exams with novel situations necessitate an application-based approach over a memorization-based examination. Ten of seventeen faculty members agreed that novel situations are those not covered in class, and 8 of 17 faculty members noted that practice with novel situations is essential as this assessment style has large applicability to the real world. This may be the reason that the opinion of year 4 students is closely aligned with that of faculty members on the quantitative survey. Open-ended problems, with or without novelty, overcome the barrier of multiple-choice question exams in that the student is now able to provide justification for their response and it becomes possible for faculty members to ascertain the thought process that went into the selection (14).

From year 1, the BHSc (Honors) curriculum exposes students to broad concept-based learning that can be applied to many situations, with examinations that often use scenarios with fictitious molecules and data to which the student must formulate hypotheses and experimental designs to explain the problem (28). This allows for the possibility for sets of correct answers as student responses can vary greatly yet still receive full marks. By extension, novelty on exams also helps to ensure full authenticity of a student’s work, an unresolved impediment in current models of university examinations (27). By year 4, BHSc (Honors) students will have had many more opportunities in their coursework to become comfortable with providing inferences and justification to open-ended problems that use material “not covered in class.” However, while both upper-year students and faculty members desire to be prepared for the real world, it must be remembered that achieving high marks is paramount for the vast majority of students.

**Statement 14: Exams Written as a Group to Enhance Learning**

The BHSc (Honors) program fosters group interactions and learning through all 4 yr of the program. Cooperative learning in university classes has its roots in the theories of social interdependence and behavioral learning. Since 1960, over 300 studies have compared the relative efficacy of cooperative and individual learning in postsecondary institutions (25). However, whether assessment of individual performance through group tests will be perceived as meaningful is uncertain. This question was posed to expand on “cooperative learning” to encapsulate student and faculty opinions on “cooperative assessment.”

**Discrepancies.** We felt that students having been conditioned to group learning would have a more positive opinion of this form of assessment. Although the mean scores of faculty members were low, there were also differences in opinion between students themselves, and particularly striking was the higher scores given by year 2 students in relation to all others.

**Followup statement.** We posed the following followup question: What might be some problems that both students and educators encounter when implementing group examinations? Please explain any other concerns you had with this question. This allowed students and faculty members to comment on their experiences with using group examinations in their classes. Specifically, we wanted to uncover why it was that year 2 students appeared to differ from their peers.

**Interpretation of statement 14 and discussion.** This discrepancy was uncovered in the followup questionnaire, wherein only 6 of 16 year 2 students felt that a group examination would result in unequal contribution by students. In comparison, 18 of 27 year 1 students, 14 of 17 year 3 students, and 8 of 11 year 4 students felt the danger of unequal contribution by certain group members (with 5 of 8 year 4 students using the term “social loafing” to describe group members who failed to contribute substantially to the group task). Evidently, year 2 students did not share this opinion. Additionally, the followup questionnaire demonstrated that 20 of 55 year 1, 3, and 4 students (compared with 4 of 16 year 2 students) felt that the mark given on a group examination would not be truly reflective of each student.

What prompted these discrepancies among BHSc (Honors) students? The survey was taken by students in the fall term. Year 1 students in this program had taken several intense courses where group work was fostered, encouraged, and supported. The excitement of doing those group projects may have carried over into year 2, and students were more optimistic about this approach. In later years, students are more concerned with maximizing their own chances of getting into competitive professional schools, and this emphasis on grades may affect their views.

Kagan (16) agrees, claiming that group grades are never justified, and Deutsch (8) too calls into the question the fairness of having all members of the group receive the same reward. Overall, it would appear from our findings that the essence of cooperative learning is not consistent among BHSc (Honors) students. The dichotomy between collaboration on an exam and self-ownership of work, especially among years 3 and 4 students, suggests that the latter will prove triumphant.

Morgan (25) noted that students should be prepared to work in an environment wherein they will be expected to complete tasks as a team and be rewarded as team. According to our data, faculty members are not too keen on assessing in this manner: 9 of 17 faculty members noted the danger of unequal contribution by students in the group and 10 of 17 faculty members believed that group examinations do not accurately gauge individual learn-
ing. One faculty member opined: “A ‘group’ does not graduate with a degree; individual students do.”

Other findings have shown that faculty members agree in assessing their students in a way that challenges their social interactions as well as their ability to amalgamate a variety of concepts (18, 15). Six of our seventeen faculty responses noted the possibility of conflicts arising in a group examination, although whether these individuals believed that conflict is essential or detrimental to collaboration could not be determined.

Conclusions and Limitations of the Study

Assessment drives student learning, and the results of this report exemplify the need to reassess how our educational institutions are assessing their students. We set out to explore the contrasting views of students and faculty members on the assessments used in our program. Our initial hypothesis was that students will see these from the perspective of either deep or strategic learners, whereas faculty members would take the longer-term view and regard assessments that foster deeper learning as more meaningful.

In general, those expectations were realized. There was general agreement between the two parties on a number of significant issues between all student groups and faculty members. Thus, both recognized the value of exams and the need to provide a good learning experience to help them prepare for the future. In addition, there was agreement on having multiple assessment procedures, for assessments that tested conceptual understanding, and those that allow students to find new information to solve problems. These are approaches that foster deeper learning.

There were clear differences of opinion noted on some issues. The issue of rubrics clearly divided faculty members from the students. Here the students, quite understandably, were taking a more strategic view. On the other hand, whereas students were strongly in favor of selecting their own format for assessment, faculty members were more reluctant to cede control. There were differences also noted between students from different years. These could not readily fit the overall hypothesis but needed to take into account more specific factors that could provide an explanation.

It is important to stress the limitations of the study. This study offers a snapshot of student and faculty opinions on examinations. It is not a longitudinal study, as no cohort was surveyed more than once. Although we did our best to get as many responses as possible, the response rates for different years only ranged from 65% to 74%. The response from faculty members was more disappointing (40%). The students surveyed belong to one specific program, and the generalizability is limited. Given these limitations, our conclusions need to be tentative (e.g., year 3 students’ perception on creativity).

Future research would be aimed at gathering student and faculty opinions from a variety of other university faculties (e.g., the humanities, engineering, etc.) regarding the use of examinations in their specific courses to compare similar and diverging opinions across different disciplines. In addition, it would be useful to have alternative (more intense qualitative) approaches to deciphering student and faculty opinions on this very important topic.

Reevaluation of how one tests students leads to the reconsideration of how they are taught. Is the goal of education standardization or preparation? Examinations have dominated a student’s education from a very young age. However, if students do not see a greater purpose to their examinations, their prospects for becoming creative thinkers and intuitive problem solvers become limited.

It is striking that both parties gave the highest scores (students: 8.64 ± 1.71 and faculty members: 8.03 ± 2.34) on the last statement, statement 15: examinations should provide a good learning experience that helps students prepare for the future. Examinations have often been seen as assessments of learning, so the recognition that they can be assessments for learning augurs well. To return to an issue we raised at the outset, examinations as seen from our survey could well be a boon than just a bane.

APPENDIX A: 15-STATEMENT SURVEY GIVEN TO STUDENTS

Statement 1. Exams are important to me as they provide a basis for their my learning.
Statement 2. Students should be examined using a variety of methods (oral, written, practical, etc.).
Statement 3. Students should be provided a clear marking scheme (rubric) for each exam, whether it be oral, written, practical, etc.
Statement 4. I would prefer to select an exam format that could best demonstrate my learning.
Statement 5. I would prefer an exam that allows me to find new information to solve problems.
Statement 6. An exam should test my conceptual understanding of the subject. (Conceptual understanding meaning the ability to use your understanding of how we got the answer as opposed to memorizing a relationship.)
Statement 7. I would prefer an exam where I can demonstrate that I clearly and logically reasoned out my answers.
Statement 8. I would prefer an exam where each question has no single correct answer.
Statement 9. I would prefer an exam where I can demonstrate my creativity.
Statement 10. I would prefer an exam where teachers give only comments and no marks.
Statement 11. Clear comments on my exam are more important that my mark.
Statement 12. I would prefer an exam that tests my abilities to apply what I have learned to novel situations.
Statement 13. Students must be given an opportunity to explain answers they give on an exam.
Statement 14. An exam written as a group will enhance my learning.
Statement 15. The exam should provide a good learning experience that helps me prepare for the future.

APPENDIX B: 15-STATEMENT SURVEY GIVEN TO FACULTY MEMBERS

Statement 1. Exams are important to students as they provide them a basis for assessing their own learning.
Statement 2. Student learning should be examined using a variety of methods (for example, oral, written, practical, etc.).
Statement 3. Students should be provided a clear marking scheme (rubric) for each exam, whether it be oral, written, practical, etc.
Statement 4. Students should be able to select an exam format that could best demonstrate their learning.

Statement 5. Exams should allow students to find new information to solve problems.

Statement 6. Exams should test students’ conceptual understanding of the subject. (Conceptual understanding meaning the ability to use their understanding of how they got the answer as opposed to memorizing a relationship.)

Statement 7. Students should be given exams where they can demonstrate that they clearly and logically reasoned out each of their answers.

Statement 8. Students should be given exams where each question has no single correct answer.

Statement 9. Students should be given exams where each question has no single correct answer.

Statement 10. Teachers should give only comments on exams and not marks.

Statement 11. Clear comments on exams are more important for students than the marks they get.

Statement 12. Students should be given exams that tests their abilities to apply what they have learned to a novel situation.

Statement 13. Students must be given an opportunity to explain answers they give on an exam.

Statement 14. Exams written as a group will enhance student learning.

Statement 15. Exams should provide students with a good learning experience that helps them prepare for the future.

ACKNOWLEDGEMENTS
The authors owe a debt to Canadian taxpayers for funding our educational institutions and trusting them to prepare students for the future. The authors thank Mohsin Ali, Jennifer Landicho, Manu Rangachari, and Paul White for helpful comments. Finally, the authors thank Del Harnish, the assistant dean of the program, who encouraged us at every step.

DISCLOSURES
No conflicts of interest, financial or otherwise, are declared by the author(s).

AUTHOR CONTRIBUTIONS

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